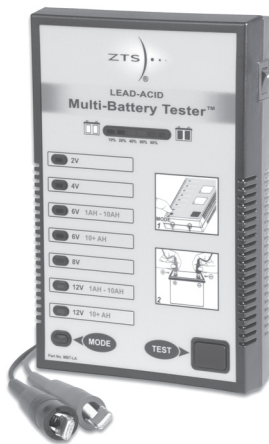




Lead Acid Multi-Battery Tester™



Operating Instructions

Product Description

The ZTS Lead-Acid Multi-Battery Tester™ (MBT-LA) provides a complete means of testing the State of Charge or State of Power for 2V, 4V, 6V, 8V, and 12V AGM or sealed lead acid battery types. The MBT-LA is designed to test popular SLA rechargeable batteries using a patented, high accuracy pulse load test. A fully automatic test cycle, indicated by 'running' LEDs, begins when the TEST key is pressed. After each pulse-load test, a single LED indicates percentage of remaining battery capacity. Batteries will not be harmed by repeated testing or by maintaining connection after a test cycle. This test set operates from 4 AA batteries (not included).

Setup

- 1) Locate and open the battery cover door then install 4 AA alkaline batteries, carefully noting the proper orientation. Replace the battery cover door.
- 2) Turn on the power switch located on the right side of the tester. The '2V' mode LED should be lighted.

NOTE: For proper operation, MBT-LA must be powered-on before connecting the test leads to a battery.

Testing Batteries

- 1) Select the MODE which corresponds to the battery to be tested.
- 2) Connect the test leads securely to the battery's terminals. Verify that the red test lead is connected to battery positive (+) and black to battery negative (-).

- 3) Press the **TEST** button once. All LEDs should 'run' for 15 seconds indicating a pulse load test in progress. Next, a single LED will remain lighted indicating the battery's state of charge, or remaining battery capacity. Make 2 tests at five second intervals, to verify that the battery has stabilized and is delivering consistent power (especially if the battery is tested directly after being disconnected from a float charger).

Note: There are two different 6V and 12V MODE options depending on battery capacity. Choose the one which corresponds to the battery being tested.

Understanding Test Results

The following are guidelines for correlating test results to overall battery condition:

- 1) A battery which repeatedly tests 80% or higher is nearly fully charged and is in good condition. Batteries that are tested directly after being disconnected from float charge should test 100% to 80% for 2 consecutive tests. A test result of 60% or lower indicates a failing battery.
- 2) Batteries which test 60% or lower may be:
 - a. Not fully charged but otherwise in good condition and still capable of taking a full charge.
 - b. Fully charged but with diminished capacity due to age or excessive charge-discharge cycles.

Note: Generally, a battery which has recently been charged or been on float should indicate 80-100%

for two tests. Results of 60% or lower indicate diminished battery capacity. SLA batteries usually have diminished capacity after 3-5 years of service depending on ambient temperatures and the number of charge-discharge cycles experienced by the battery.

- 3) If LEDs blink during a test but no result is displayed:
 - a. The battery is completely discharged or defective.
 - b. The **MODE** is incorrect for that battery.
- 4) Batteries of relatively small capacity, i.e. 1AH to 2AH, may indicate one LED lower than actual capacity due to the size of the pulse load relative to their capacity.

Techniques for Accurate Test Results

- 1) Clean connections are important. Verify that the battery's terminals are free of any visible contamination or corrosion.
- 2) Select the proper MODE for the battery. For example, select "6V 10+AH" for a 6-volt, 15 AH battery. Using another MODE will not harm the tester, but the test results will be incorrect.
- 3) Make two tests, 5 seconds apart. This verifies that the battery is stabilized and capable of consistent power output under the pulse load.
- 4) Connect the tester's clamps directly to the battery terminals. **Any extension or modification to the tester's lead wires can cause testing errors.**
- 5) Disconnect the battery from other circuits before testing. A battery connected to a "float" charging system may test higher than it does out of circuit (stand alone). The MBT-LA is designed to test batteries out of circuit.

Temperature Compensation

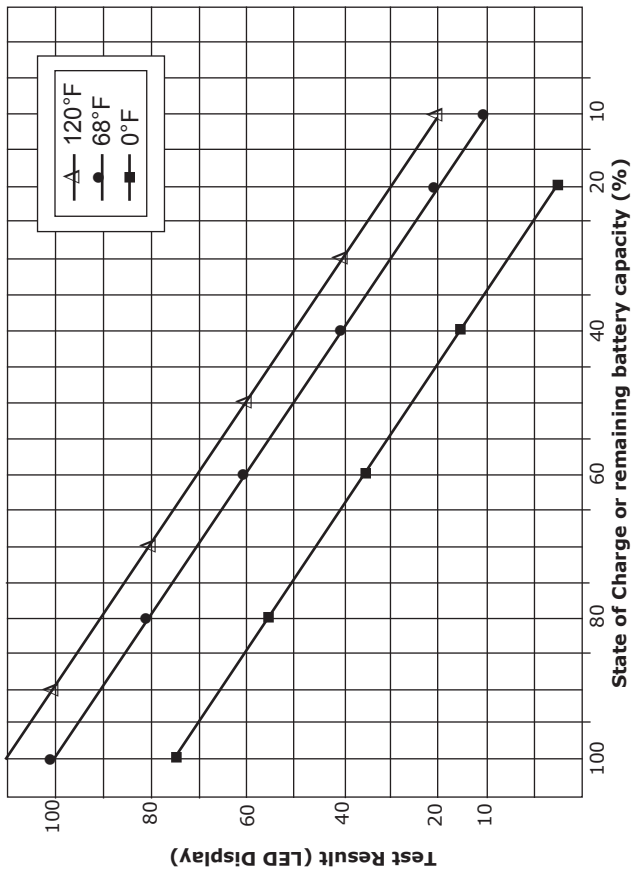
SLA batteries exhibit a direct relationship between temperature and their ability to deliver current or maintain voltage under load. The actual capacity of a SLA battery is a function of temperature and the rate of discharge. For example, a battery will indicate a lower state of charge, or lower remaining capacity, as temperature decreases, and will indicate a higher state of charge (SOC) as temperature increases.

The MBT-LA is designed to test SLA batteries whose ambient temperature is between 50° - 85°F (10°-30° C). The following chart shows the effect of temperature on the test result. Referring to the chart, notice that a battery whose SOC is 100% will produce a test result of 100% at 68°F. This same battery will produce a test result between 80% and 60% when its temperature is 0°F. Conversely, a battery whose SOC is 90% will produce a test result of 100% at 120°F. In all cases, the MBT-LA will indicate the actual remaining battery capacity that is available at a given temperature.

Testing Multiple Battery Systems

SLA cells are nominally 2.15 volts each and are combined in groups to make batteries with 4V, 6V, 8V, and 12V at the terminals. In certain applications, batteries of equal voltage and capacity are connected in series or parallel to increase voltage, capacity or both. For example, four 6v batteries may be connected in series to produce a 24V strand.



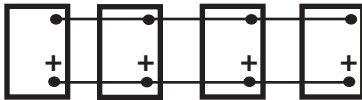


When testing batteries which are wired in series, there is no need to remove connections between batteries. Simply test each battery individually, by connecting directly to its terminals.

NOTE: Do not connect the MBT-LA to sources greater than 12VDC, doing so may damage the tester.

Parallel Connection

In applications that have high power requirements, SLA batteries are often wired in parallel, sometimes in combination with series connections.



When testing batteries connected in parallel, it is necessary to disconnect one terminal to test the battery accurately. Testing a group, as shown in the illustration, takes into account all batteries and their inter-connections. This can be done with 6v and 12v systems, where the total AH capacity does not exceed 100AH. Verify that the tester is set to "10+AH" if total capacity exceeds that amount. A reading below 80% indicates one or more defective batteries or high resistance inter-connections within the group.

Batteries under Charge

It is not recommended that batteries be tested when connected to a charging or "float" system. Disconnect the charger for several minutes then test the battery three or more times.

Operating Problems / Troubleshooting

- 1) No operation and no LED activity.
 - a. Verify proper orientation of internal AA batteries
 - b. Clean the AA battery terminals.

- 2) Only two red LEDs blink during the test cycle.
 - a. This indicates that the tester's 4 AA batteries are low. Replace with 4 new alkaline AA.

- 3) **MODE** button has no effect on battery selection or **TEST** won't begin.
 - a. Verify that the test leads are not connected to a battery until *after* the unit is turned on.
 - b. Turn power switch off for 5 seconds, then restart.
 - c. Verify test lead polarity is correct.

About SLA Batteries

Capacity

This is the total amount of stored energy that is available from a fully charged cell or cells. A battery's actual capacity is dependent upon the rate of discharge, temperature, and the specified cut-off voltage. Most batteries have a rated capacity, expressed in amp-hours (AH), that is based on a 20 hour constant discharge to a cut-off voltage of 1.75v per cell. For example, a 6v battery with a rated capacity of 5AH will deliver 250mA for 20 hours before its voltage drops to 5.25v. Capacity will decrease at higher rates of discharge and increase with lower rates of discharge. A battery will achieve optimum capacity after several charge-discharge cycles, or by float charging it for at least 30 days.

Self Discharge

Batteries that are stored at room temperature will lose, on average, about 3% of their charge per month through self discharge. Thus a new, fully charged battery which has been stored for a year may test 60% until it is recharged.

Battery Life

SLA batteries will lose capacity through aging. For example, a battery on float charge (stand-by use) will fall to about 60% of its original rated capacity after 3-5 years of service. In cyclic use, a typical battery will produce about 500 charge-discharge cycles before falling to 60% of original rated capacity. Other factors that affect capacity are the depth and rate of discharge, ambient temperature, and charging method.

Specifications

Testing capability (SLA battery):

2v

4v

6v [1AH-10AH]

6v [10AH - 100AH]

8v

12v [1AH-10AH]

12v [10AH-100AH]

Power (internal): 4 AA. Auto self test.

Testing load: Varies according to battery type

Testing cycle: Microprocessor-controlled pulse load

Display: Green, yellow, and red LEDs

Terminals: Solid copper clamps

30"/76cm test lead wire

Dimensions: 8.75" x 5.5" x 1.75"

22.2cm x 14cm x 4.4cm

Weight: 23 oz. / 656g (without batteries)

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PuLse Load **Multi-Battery Tester™**

- Test SLA 2v, 4v, 6v, 8v, 12v batteries
- Quickly and easily identify weak or failing batteries
- Fully automatic - Patented, high accuracy Pulse Load test
- Ideal for maintenance of UPS, telecom, alarm systems, lighting, and more

Applications:

- UPS
- Fire Alarm
- Security
- Industrial
- Medical
- Emergency lighting
- Manufacturing
- Quality Assurance
- Battery management
- Utilities
- Safety
- Scientific
- Government
- Office
- Military
- Institutions



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Part No. MBT-LA
U.S. Patent 6,823,274

Made in U.S.A.

Uses 4 AA batteries (not included)